

## CLAIMS

What is claimed is:

1. A plant comprising:  
  
a vacuum stripper that is configured to produce an ultra-lean physical solvent from a lean hydrogen sulfide-containing physical solvent; and  
  
at least one of a high-pressure flash vessel and a medium pressure flash vessel coupled to the vacuum stripper, wherein the at least one of the high-pressure flash vessel and the medium pressure flash vessel provide a substantially hydrogen sulfide-free stripping gas to the vacuum stripper.
2. The plant of claim 1 further comprising an absorber that receives the ultra-lean physical solvent and that is configured to operate with an isothermal gradient or with a decreasing top-to-bottom thermal gradient.
3. The plant of claim 2 wherein the absorber receives a feed gas that comprises at least 10 mol% carbon dioxide and at least 500 ppm hydrogen sulfide.
4. The plant of claim 3 wherein the feed gas has a pressure of at least 1000 psig.
5. The plant of claim 4 wherein the feed gas is at least partially dehydrated, and wherein the at least partially dehydrated feed gas is further cooled by a rich solvent.
6. The plant of claim 1 wherein the lean hydrogen sulfide-containing physical solvent comprises at least 100 ppm hydrogen sulfide, and wherein the ultra-lean physical solvent comprises less than 100 ppm hydrogen sulfide.
7. The plant of claim 6 wherein the ultra-lean solvent comprises less than 10 ppm hydrogen sulfide.
8. The plant of claim 1 wherein the lean hydrogen sulfide-containing physical solvent is selected from the group consisting of propylene carbonate, n-methyl pyrrolidone, dimethyl ether of polyethylene glycol, and tributyl phosphate.

9. The plant of claim 1 wherein the substantially hydrogen sulfide-free stripping gas comprises at least 95 mol% carbon dioxide.
10. The plant of claim 1 further comprising a separator in which acid gas is separated from a rich solvent, thereby producing the lean hydrogen sulfide-containing physical solvent, and wherein part of the acid gas is compressed and injected into a formation.
11. The plant of claim 10 wherein the vacuum stripper further produces a second acid gas that is combined with the acid gas from the separator.
12. A method of producing an ultra-lean physical solvent, comprising:  
  
separating in at least one of a high-pressure flash vessel and a medium pressure flash vessel a substantially hydrogen sulfide-free stripping gas from a physical solvent;  
  
and  
  
stripping hydrogen sulfide from a lean hydrogen sulfide-containing physical solvent in a vacuum stripper to form the ultra-lean physical solvent.
13. The method of claim 12 further comprising a step of feeding the ultra-lean physical solvent to an absorber, and operating the absorber with an isothermal gradient or with a decreasing top-to-bottom thermal gradient.
14. The method of claim 13 further comprising a step of feeding a feed gas to the absorber at a pressure of at least 1000 psig, wherein the feed gas comprises at least 10 mol% carbon dioxide and at least 500 ppm hydrogen sulfide.
15. The method of claim 12 wherein the lean hydrogen sulfide-containing physical solvent is selected from the group consisting of propylene carbonate, n-methyl pyrrolidone, dimethyl ether of polyethylene glycol, and tributyl phosphate.
16. The method of claim 12 wherein the substantially hydrogen sulfide-free stripping gas comprises at least 95 mol% carbon dioxide.